THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today
(1) was not written for publication in a law journal and
(2) is not binding precedent of the Board.

Paper No. 26

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KATSUYA IWASAKI,
HIROSHI HOYA, and MAKOTO KIMURA

Appeal No. 1996-3507
Application 08/041,209[1]

HEARD: September 15, 1999

Before KRASS, MARTIN, and GROSS, Administrative Patent Judges.

MARTIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1-13, all of the pending claims, under 35 U.S.C. § 103. We reverse.

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[1] Application for patent filed April 1, 1993.

A. The invention

Appellants' claims are directed to an automotive suspension system employing front and rear shock absorbers having electrically controllable damping coefficients which are set to higher values while the vehicle is in a substantially stopped condition (i.e., the vehicle speed is substantially zero) in order to suppress "squatting" of the vehicle as it accelerates from the substantially stopped condition.

Referring to Figure 1, each of the four shock absorbers SA_1-SA_4 includes a pulse motor 3 for adjusting the angular position of an adjusting pin 40 (Fig. 4) to provide continuous adjustment of the damping characteristic of the shock absorber. As shown in Figure 6, the damping characteristic has three regions:

(a) an HS region in which extension (also called rebounding) of the shock absorber is highly damped while contraction (also called compression or bounding) is lightly damped;

(b) an SS region in which both extension and contraction are lightly damped; and

(c) an SH region in which extension is lightly damped and contraction is highly damped.

Figures 13 and 14 together show the flowchart of a routine comprising a first embodiment of appellants' control system, with Figure 13 showing the steps involved in suppressing squatting as the vehicle accelerates from a stopped or parked position. When the vehicle speed (detected at step 101) is determined at step 102 to be equal to zero, the front shock absorbers are set to a value in the HS range (high extension damping, low compression damping) and the rear shock absorbers are set to a value in the SH range (high compression damping, low extension damping) (Spec. at 11, line 9 to p. 12, line 10). The result is that the damping coefficients are set at the values required for squatting suppression prior to the time the vehicle begins to accelerate from a stopped position.

Whenever it is determined at step 102 that the vehicle speed is not equal to zero, the routine proceeds instead to step 104 for what is termed "basic control" (Spec. at 11, lines 23-26). This basic control routine, which presumably is shown in Figure 14,[2] controls the damping coefficients during driving.

Figure 16 illustrates an alternate routine for suppressing squatting, which takes into account both vehicle speed and the vertical speeds of the portions of the vehicle body adjacent to the shock absorbers. Specifically, after the vehicle speed is detected at step 302 to be substantially zero and after the vertical speed has been determined to be between positive threshold value V_A and negative threshold value V_B for a predetermined period of time)t (steps 303 and 304), the front shock absorbers are set to a value in the HS range (high extension damping, low compression damping) and the rear shock absorbers are set to a value in the SH range (high compression damping, low extension damping) (step 305). As in the first embodiment, the result is that the damping coefficients are set at the values required for squatting suppression prior to

[2] In Figure 14, it would appear that step 201 should be shown as receiving an input from step 102 rather than from step 104. Likewise, the specification appears to be in error in stating (at 12, lines 11-12) that "<u>after</u> step 104 the routine proceeds to step 201" (emphasis added).

the time the vehicle begins to accelerate from a substantially stopped condition.

Figures 18 and 19 together show the routine used in a third embodiment of the invention, with Figure 18 showing the steps involved in suppressing squatting and Figure 19 showing the routine which controls damping during driving. Referring to Figure 18, when the routine determines at step 404 that the vehicle speed is zero, it then determines whether the absolute value of the vertical speed is less than a threshold value V_t (step 405). If the answer is yes and remains yes for a predetermined period T_t as measured by a counter (step 407), step 408 is reached, wherein parking suspension control is activated.

B. The claims

Claims 1 and 8, the only independent claims, read as follows:

1. A suspension control system for an automotive vehicle comprising:

a front shock absorber disposed between a vehicle body and a suspension member rotatably supporting a front wheel, said front shock absorber being controllable to assume damping force characteristics in a range between preselected higher and lower damping coefficients over extension and compression strokes;

a rear shock absorber disposed between the vehicle body and a suspension member rotatably supporting a rear wheel, said rear shock absorber being controllable to assume damping force characteristics in the range between the preselected higher and lower damping coefficients over extension and compression strokes;

vehicle speed sensor means for detecting vehicle speed and providing a signal indicative thereof; and

control means responsive to the signal from said vehicle speed sensor means to provide control signals for controlling said front and rear shock absorbers in a manner wherein the damping force characteristics of said front shock absorber in the extension stroke and of said rear shock absorber in the compression stroke are modified to and maintained at the higher damping coefficients respective[ly] whenever the vehicle speed is substantially zero.

8. A suspension control system for an automotive vehicle comprising:

shock absorbers disposed between a vehicle body and a suspension member rotatably supporting a wheel respectively, each shock absorber being controllable to assume damping force characteristics in a range between preselected higher and lower damping coefficients over extension and compression strokes;

vehicle speed sensor means for detecting vehicle speed and providing a signal indicative thereof;

vertical speed determining means for determining vertical speed of the vehicle body and providing a signal indicative thereof; and

control means responsive to the signals from said vehicle speed sensor means and said vertical speed determining means to provide control signals for controlling said shock absorbers in a manner wherein the damping force characteristics of said shock absorbers are maintained at a preselected high damping coefficient within the range between the preselected higher and lower damping coefficients when the vehicle speed is substantially zero and the vertical speed is below a preselected threshold value for a preselected period of time.

Claim 1, by calling for the higher damping characteristics to be selected and maintained <u>whenever</u> the vehicle speed is substantially zero, is directed to the squatting control routine (Fig. 13) employed in the first embodiment of appellants' control system, wherein selection of the higher damping coefficients is based solely on the condition of a substantially zero vehicle speed. As conceded by counsel at the oral hearing, this means that dependent claim 2, which calls for selection of the higher damping coefficients to be based on a combination of a substantially zero vehicle speed and a "vehicle attitude change . . . below a preselected degree," fails to further limit claim 1, as required by 35 U.S.C. § 112, fourth paragraph. The same criticism applies equally to the claims that depend on claim 2, i.e., claims 3, 4, 6, and 7. We leave it to the examiner to consider entering a rejection of these claims under § 112, fourth paragraph, following this appeal.

Independent claim 8, which like claim 2 calls for controlling the damping characteristics in response to vehicle speed and vertical speed, is directed to the squatting control routines employed in appellants' second and third embodiments of the control system (Figures 16 and 18).

C. The references and grounds of rejection

The § 103 rejections are based on the following U.S. patents:

Ema	4,975,849	Dec. 12, 1990
Athanas et al. (Athanas)	5,016,908	May 21, 1991
Matsumoto et al. (Matsumoto)	5,162,996	Nov. 10, 1992

Claims 1-4 and 6-13 stand rejected under § 103 as unpatentable over Ema in view of Matsumoto.

Claim 5 stands rejected under § 103 as unpatentable over Ema and Matsumoto in view of Athanas.

Ema discloses two embodiments each employing two different types of suspension unit control. Referring to the first embodiment (Figures 1-9), the first type of control, which is responsive to vehicle speed, steering angle, and hydraulic fluid pressure, adjusts the attitude of the vehicle by controlling the vertical position of the piston 13 (Fig. 3) in each suspension unit by adding hydraulic oil to or discharging hydraulic oil from chamber 14A (col. 4, lines 26-49). The second type of control is expressly described as damping control. Specifically, control unit 34 acts through selector 21 (Fig. 3) to selectively connect one or more of damper valves 20A and 20B and associated accumulators 22A and 22B (Fig. 3) to branch 19 and thus to fluid path 16 in order to adjust the spring constant and damping characteristic of each suspension unit (col. 4, lines 50-55; col. 5, lines 23-28 and 41-47; col. 9, lines 33-37). The decision to adjust the damping characteristic in this manner is based on only the vertical speed (col. 9, lines 37-53).

Ema's second embodiment, shown in Figures 10-14, additionally employs a throttle speed sensor 36 and a brake sensor 37 (Fig. 11) to permit the system to control the piston positions for suppressing squatting and reactive jerk in the manner shown in Figure 12 (col. 12, lines 17-20) and also for suppressing nose-dive and reactive jerk in the manner shown in Figure 13 (col. 14, lines 32-35). Of these two figures,

Figure 12 (squatting control) is the more relevant, because it involves a determination of when the vehicle speed is substantially zero, as required by the claims.

As appellants correctly note (Brief at 9), Ema's control of the piston height as shown in Figure 12 does not constitute control of the damping coefficient, as required by appellants' claims. Appellants are also correct to note that even if it did, Ema fails to show selecting and maintaining the highest (or lowest) piston level whenever the vehicle speed is substantially zero, as required by claim 1. Instead, during the period ending at time t_1, while the vehicle speed is substantially zero, the control unit selects and maintains the intermediate or neutral piston height value N. Although the second embodiment also employs damping control (col. 10, lines 55-59), it is the same as the damping control in the first embodiment, which is responsive to vertical speed rather than vehicle speed. Thus, although Ema discloses using vertical speed to control the damping characteristic and using vehicle speed to control the piston height, Ema does not disclose or suggest using vehicle speed, let alone a substantially zero vehicle speed, as the basis for selecting higher damping coefficients. The examiner contends that this feature is taught by Matsumoto, who "disclose[s] shock absorber control by monitoring vehicle speed and vehicle height change" (Answer at 3). Although Matsumoto's Figure 2 shows the system to be responsive to a speed sensor 45, Matsumoto does not explain what effect, if any, vehicle speed has on the control of the damping force. As a result, Matsumoto would have provided no motivation to make Ema's damping control circuitry responsive to vehicle speed, let alone to make it select and maintain the highest damping coefficients whenever (or even when) the vehicle speed is substantially zero.

At page 7 of the Answer, the examiner also contends that using a controller to control the suspension units and adjust the
damping force for each unit is admitted by appellants to be known in the art, citing the specification at "page 11, second paragraph." Because that part of the specification concerns appellants' invention, we assume the examiner meant to cite page 1, second paragraph, which discusses the control system described in Japanese Patent Publication No. 61-75007. The Answer's reliance on this admitted prior art is improper,

because it is not mentioned in the statement of the rejection. Compare MPEP § 706.02(j) (7th ed., July 1998): "Where a reference is relied on to support a rejection, whether or not in a minor capacity, that reference should be positively included in the statement of the rejection. See In re Hoch, 428 F.2d 1341, 1342 n.3, 166 USPQ 406, 407 n.3 (CCPA 1970)." In any event, this admitted prior art involves controlling damping as a function of the position of the accelerator pedal, not as a function of vehicle speed, as required by appellants' claims.

For the foregoing reasons, the rejection of claim 1 is reversed.

Claim 8, which recites shock absorbers without specifying that they are front and rear shock absorbers, specifies that "the damping force characteristics of said shock absorbers are maintained at a preselected high damping coefficient . . . when the vehicle speed is substantially zero and the vertical speed is below a preselected threshold value for a selected period of time." This claim reads on the squatting suppression routines employed in appellants' second and third embodiments (Figures 16 and 18). For the reasons already discussed, Ema and Matsumoto fail to disclose or suggest using a substantially zero vehicle speed as the basis for selecting higher damping coefficients. A fortiori, they fail to suggest basing the selection on a combination of a substantially zero vehicle speed and a vertical speed that remains below a preselected threshold value for a preselected period of time. Consequently, the rejection of claim 8 over Ema and Matsumoto is reversed. For the same reasons, we are reversing the rejection over these references of claim 2, which but for its improper dependence on claim 1 would be similar in scope to claim 8. The rejection of claims 3, 4, 6, and 7, which depend on claim 2, is reversed because the rejection of claim 2 is reversed.

The rejection of claims 10 and 12, which are properly dependent on claim 1, is reversed because the rejection of claim 1 has been reversed. Likewise, the rejection of claims 9, 11, and 13, which are properly dependent on claim 8, is reversed because the rejection of that claim has been reversed.

Claim 5, which depends on claim 1, specifies that each shock absorber is controllable to provide a "softer damping range," a "rebounding harder damping range," and a "bounding harder damping range" and calls for selection of the rebounding harder damping range when the vertical speed is in the rebounding direction and selection of bounding harder damping range when the vertical speed is in the bounding direction. This claim stands rejected for obviousness over Ema and Matsumoto further in view of Athanas, which the examiner cites to show that these features were known. This rejection is reversed because Athanas does not cure the deficiencies of Ema and Matsumoto with respect to claim 1, on which claim 5 properly depends.

REVERSED

ERROL A. KRASS Administrative Patent Judge	)	
	)	BOARD OF PATENT
JOHN C. MARTIN Administrative Patent Judge	)	APPEALS AND
	)	INTERFERENCES
ANITA PELLMAN GROSS Administrative Patent Judge	)	

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Ronald P. Kananen, Esq.
Rader, Fishman & Grauer, P.L.L.C.
1233 20th Street, N.W., Suite 501
Washington, DC 20036